

Structural Health Monitoring with Fiber Bragg Grating and Piezo Arrays, Phase II

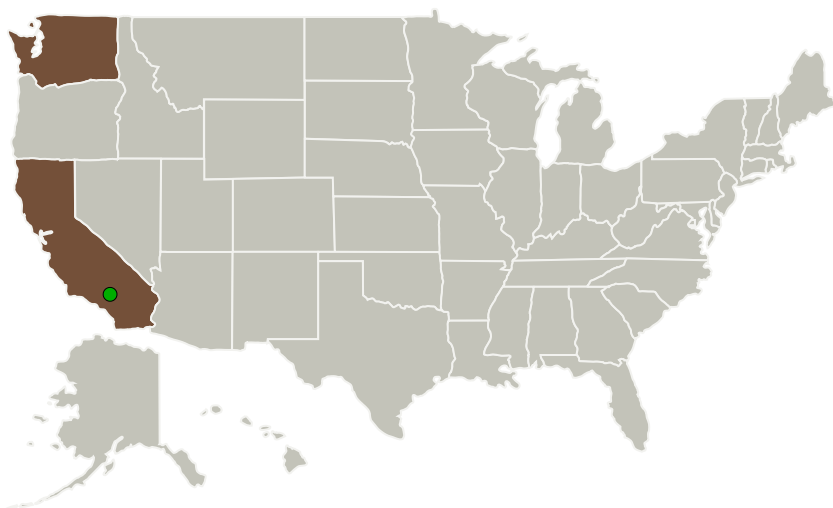
Completed Technology Project (2010 - 2013)



Project Introduction

IFOS and its research institute collaborator, Washington State University (WSU), have demonstrated feasibility of a structural health monitoring (SHM) system for aerospace vehicles such as Unmanned Aerial Vehicles (UAVs) or commercial airliners. In Phase 1, a unique high-speed, high-channel count fiber Bragg grating (FBG) sensor interrogation system enabling a new Lamb wave-based damage detection method was demonstrated. This SHM system allows accurate detection of damage in rectangular composite plates simultaneously collected from a plurality of strategically placed FBG sensors using relatively few piezo actuators. Utilization of structurally integrated, distributed sensors to monitor the health of a structure allows for high-speed collection and interpretation of sensor signals, coupled with real-time data processing. The proposed system provides automated diagnosis and prognosis capabilities, greatly reducing the overall inspection burden. Phase 2 is designed to advance the technology towards specific NASA flight research testbed platforms, particularly Ikhana. During Phase 2, IFOS will collaborate with prime system contractors to address challenges and risks associated with the intended operational environment, including (a) generation of a complete flight worthy design, (b) performance enhancement and ruggedization of the interrogator and sensors, (c) optimization of damage detection algorithms and their implementation, and (d) total system performance validation and evaluation.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Intelligent Fiber Optic Systems Corporation	Lead Organization	Industry	Santa Clara, California
● Armstrong Flight Research Center(AFRC)	Supporting Organization	NASA Center	Edwards, California
Washington State University	Supporting Organization	Academia	Pullman, Washington

Primary U.S. Work Locations

California	Washington
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Project Transitions

▶ **August 2010:** Project Start

✓ **May 2013:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/137335>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Intelligent Fiber Optic Systems Corporation

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

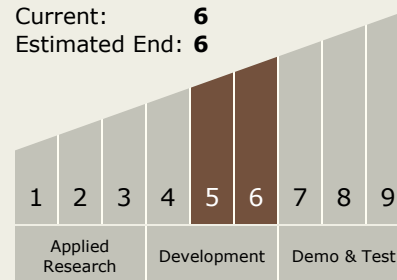
Ferey Faridian

Technology Maturity (TRL)

Start: 5

Current: 6

Estimated End: 6



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Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.3 In-Situ Instruments and Sensors
 - └ TX08.3.5 Electromagnetic Wave Based Sensors

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System